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SUBSURFACE INVESTIGATION AND SOILS REPORT

DESCRIPTION: 17055 Red Barn Road,
El Paso County, Colorado

Prepared for:
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SCOPE

This study was done to determine preliminary soils, Onsite Wastewater Treatment System (OWTS) suitability, and geology report with embankment analysis at the above referenced site.

The site is located in El Paso County, Colorado, northwest of the Town of Peyton. Ground cover consists of native grasses and small brush (weeds). The site generally slopes approximately 3% to the northeast on the property. The property is the *SW 1/4* of the NW 1/4 of Section 13, T. 11 S., R. 64 W. of the 6th P.M., El Paso County, Colorado. It is our understanding that the property is to be subdivided into *seven (7) residential* lots. The majority of the lots surrounding the property have houses and OWTS already constructed.

FIELD EVALUATION

On August 1, 2019 Test **Holes A-1** through **A-5** were drilled across the south portion of the property. *The test holes were all drilled to a depth of twelve feet (12'). Groundwater was not encountered to this depth.* Samples were taken at 3'- 4' and 8'-9' depths. *The 3'- 4' depth is to match the approximate depths of shallow crawl space and garage foundation footings. The 8'- 9' depth is to match the approximate depth of basement foundation footings.* The samples were tested for gradation, Atterberg Limits, moisture content, and NRCS tactile testing. The attached Location Map indicates the location of the test holes on the property. The attached Log of Test Holes shows the soils encountered in the test borings. Samples were taken and tested to determine preliminary soil recommendations for the proposed structure foundations and OWTS recommendations for the site. The attached Grain Size Distribution Curves indicates the laboratory test results of the soil samples acquired during drilling.

TESTING RESULTS

The five (5) test borings were drilled to a depth of twelve feet (12'). Groundwater was not encountered to this depth. Groundwater may become shallower with a perched water table during times of high precipitation. Listed below are the test results of the samples taken.

Laboratory tests indicate the soils at the **3'-4'** depth in **Hole A-1** are A-4(0) AASHTO, ML ASTM soils. These soils are IRC (PPRBD) 2017 sandy silt. The soils are Low-swelling. No ground water was observed in the test hole to this depth.

Other mechanical properties of these soils are as follows:

Sieve Analysis, **Hole A-1 @ 3'-4':**

Sieve #	% Passing
3/4"	100
3/8"	100
#4	98
#10	95
#40	84
#100	80
#200	79

Atterberg Limit Tests, **Hole A-1 @ 3'-4':**

Liquid Limit - 31
Plastic Limit - 27
Plastic Index - 4

Natural Moisture Content, **Hole A-1 @ 3'-4':** 10.2%

Laboratory tests indicate the soils at the **8'-9'** depth in **Hole A-1** are A-4(0) AASHTO, ML ASTM soils. These soils are IRC (PPRBD) 2017 sandy silt. The soils are Low-swelling. No ground water was observed in the test hole to this depth.

Other mechanical properties of these soils are as follows:

Sieve Analysis, **Hole A-1 @ 8'-9':**

Sieve #	% Passing
3/4"	100
3/8"	100
#4	99
#10	92
#40	67
#100	63
#200	62

Atterberg Limit Tests, **Hole A-1 @ 8'-9':**

Liquid Limit - 31
Plastic Limit - 27
Plastic Index - 4

Natural Moisture Content, **Hole A-1 @ 8'-9':** 8.9%

Laboratory tests indicate the soils at the **3'-4'** depth in **Hole A-3** are A-4(0) AASHTO, CL ASTM soils. These soils are IRC (PPRBD) 2017 lean clay. The soils are Low-swelling. No ground water was observed in the test hole to this depth.

Other mechanical properties of these soils are as follows:

Sieve Analysis, **Hole A-3 @ 3'-4':**

Sieve #	% Passing
3/4"	100
3/8"	100
#4	100
#10	100
#40	97
#100	96
#200	96

Atterberg Limit Tests, **Hole A-3 @ 3'-4':**

Liquid Limit - 30
Plastic Limit - 21
Plastic Index - 9

Natural Moisture Content, **Hole A-3 @ 3'-4':** 20.4%

Laboratory tests indicate the soils at the **8'-9'** depth in **Hole A-3** are A-4(0) AASHTO, CL-ML ASTM soils. These soils are IRC (PPRBD) 2017 sandy silty lean clay. The soils are Low-swelling. No ground water was observed in the test hole to this depth.

Other mechanical properties of these soils are as follows:

Sieve Analysis, **Hole A-3 @ 8'-9':**

Sieve #	% Passing
3/4"	100
3/8"	100
#4	95
#10	91
#40	80
#100	72
#200	71

Atterberg Limit Tests, **Hole A-3 @ 8'-9':**

Liquid Limit - 25
Plastic Limit - 20
Plastic Index - 5

Natural Moisture Content, **Hole A-3 @ 8'-9':** 20.7%

Laboratory tests indicate the soils at the **3'-4'** depth in **Hole A-4** are A-6(1) AASHTO, CL ASTM soils. These soils are IRC (PPRBD) 2017 lean clay with sand. The soils are Low-swelling. No ground water was observed in the test hole to this depth.

Other mechanical properties of these soils are as follows:

Sieve Analysis, **Hole A-4 @ 3'-4':**

Sieve #	% Passing
3/4"	100
3/8"	100
#4	99
#10	96
#40	88
#100	86
#200	85

Atterberg Limit Tests, **Hole A-4 @ 3'-4':**

Liquid Limit - 32
Plastic Limit - 21
Plastic Index - 11

Natural Moisture Content, **Hole A-4 @ 3'-4':** 7.7%

Laboratory tests indicate the soils at the **8'-9'** depth in **Hole A-4** are A-6(2) AASHTO, SC ASTM soils. These soils are IRC (PPRBD) 2017 sandy clay. The soils are Low-swelling. No ground water was observed in the test hole to this depth.

Other mechanical properties of these soils are as follows:

Sieve Analysis, **Hole A-4 @ 8'-9':**

Sieve #	% Passing
3/4"	100
3/8"	100
#4	97
#10	84
#40	53
#100	47
#200	46

Atterberg Limit Tests, **Hole A-4 @ 8'-9':**

Liquid Limit - 32
Plastic Limit - 15
Plastic Index - 17

Natural Moisture Content, **Hole A-4 @ 8'-9':** 5.9%

CONCLUSIONS AND RECOMMENDATIONS

It is our understanding that the new structures on the *seven (7)* subdivided lots will be houses. *It is anticipated that the houses will be on deep (basement) and shallow (crawl space and garage) foundations.* The upper and lower soils on the property exhibit low swell potentials. The soils at the site vary from sandy silt to lean clay to sandy silty lean clay to lean clay with sand to clayey sand.

I would recommend the structures be supported on a reinforced concrete foundation. I would further recommend the use of two reinforcing bars at both the top and bottom of the foundation wall to lessen damage, should the soils settle or swell. For the soils encountered and test results, it is recommended that the foundation be a continuous spread footing and/or grade beam foundation. Four inch (4") high void forms may be needed in strategic areas under the footings and grade beams in order to achieve and balance the recommended dead load.

For the soils encountered in this preliminary investigation, it is anticipated that the foundations will be designed for maximum allowable bearing capacities of 1500 to 2500 pounds per square foot (psf) (dead load plus fill live load) with a minimum dead load of 300 to 500 psf to help counteract the swelling should the subsoils become wetted. It is recommended that the dead loads for all foundation components (foundation wall footings and pads) be balanced to help control differential movement. For the soils encountered, an equivalent fluid unit weight of at 45 to 55 pounds per cubic foot should be used for retaining wall design. It is anticipated that the foundations will bear on the native soils on the property and not on uncompacted soil, topsoil, or frozen ground.

The bottom of all foundation components should be kept at least thirty-six inches (36") below finished grade for frost protection. The open excavations should not be left open for an extended period of time or exposed to adverse weather conditions. The completed open excavations should be observed by a representative of WW Enterprises in order to verify the subsurface conditions from test hole data.

The soils at the site shows a low swell potential. Therefore, future owners should be cautioned that there is a potential risk of future damage caused by introduction of excess water to the soils and/or rock. All future owners should be directed to those items under "Post-Construction Site Preparation and Maintenance" in Appendix I, included in this report. Our experience has shown that damage to foundations usually results in saturation of the foundation soils caused by improper drainage, excessive irrigation, poorly compacted backfills, and leaky water and sewer lines. The elimination of the potential sources of excessive water will greatly minimize the risks of construction at this site.
The findings and recommendations of this report have been obtained in accordance with accepted professional engineering practices in the field of Geotechnical Engineering. There is no other warranty, either expressed or implied. This report applies only to the type of construction anticipated in the area tested. The current technology is not at a stage where a guarantee of "absolutely no damage" can be assured by design and construction practices.

CONCRETE

All concrete shall have a minimum compressive strength of 3,000 PSI in 28 days. "Green concrete shall be protected from freezing when the ambient air temperature is below 40 degrees F.

No manufactured homes shall be placed on the foundation until the concrete has obtained a strength of 2,000 PSI or not less than seven (7) days. All walls shall be adequately braced to prevent deflection.

Changes in the moisture contents may result in consolidation or swelling of the subsoils, resulting in vertical slab movement. Therefore, slabs constructed should be "free-floating" so that the slabs can move unimpaired. Slabs placed on potentially expansive soils are expected to heave. Slabs should be isolated from all structural members of the foundation, utility lines, and partition walls. There should be a minimum one and one-half-inch (1½") void placed above or below partition walls located over slabs for slabs placed on the upper soils. The void should be increased to four inches (4") for slabs placed on bedrock stratum, if encountered. Failure to allow the slab to float independently will most likely result in structural, architectural, and utility line damage. One may choose to use "Fiber Mesh" or reinforcing bars in the flat work concrete to control cracking. Slabs should be scored at ten-foot intervals in both directions to further control any cracks that may develop.

REINFORCING STEEL

All reinforcing steel shall be grade 60. The bars, where possible, shall have 3" of clearance from any concrete surface. Unless otherwise approved, bars shall be placed as per plan. Not less than two #4 or #5 bars shall be provided around all window and door openings. Such bars shall be extended to develop the bar beyond the corners of the openings but not less than 24 in. Horizontal bars shall be continuous around windows, corners and step-downs unless otherwise detailed.

SOILS COMPACTION

All soils beneath slabs or foundations shall be compacted to 95% relative compaction per ASTM D 698. Backfilling shall not start until floor joists are in place for the first floor. In case the house or building is a modular or manufactured building, the building must be set on the foundation or have bracing in place that will not allow the wall to deflect during the backfilling operation. Fill around the foundation wall shall be compacted to 90% relative compaction, per the above specifications, after the concrete has obtained a compressive strength of 2,000 psi. In no case shall the backfill be placed less than 72 hours after the concrete placement. Topsoil is to be removed and soils beneath the structure should be compacted before the construction is started.

DRAINAGE CONTROL

Grading should be such that the surface water is drained away from the foundation. Minimum grade would be 1' vertical drop per 10' horizontal away from the foundation. Gutters and downspouts should be installed to help control roof drainage and help keep water away from the foundation.

A peripheral or perimeter drain/system is recommended where slabs are to be placed below finished grade (basement or crawl space used for storage). The drain should flow by daylighting. If this is not possible, the drain should be connected to the storm sewer, or provisions for a sump pump for future installation.

Gutters and downspouts should be installed to help control the water from the roof. Extensions should be installed and maintained to ensure that they drain outside the excavated area and passed any lawn edging.

If the consistency or color of the soil is different than in the soils report, contact this office immediately.

SOILS INVESTIGATION FOR THE ON-SITE WASTEWATER TREATMENT SYSTEM (OWTS)

DETAILED SOIL INVESTIGATION

A. Soil Investigation

Method Used: Visual and tactile evaluation from the bag samples taken in the test holes was performed to provide preliminary soils evaluation for future OWTS.

B. Visual and Tactile Evaluation

The soils were observed and tested by Joe Wernsman under the supervision of Anthony J. Wernsman, P.E., who has been working as a field (soil drilling, sampling, testing and percolation tests) and laboratory (sieve analysis, Atterberg Limits, etc.) technician since 1989.

The soils were observed, tested, and compared to the soils indicated in Table 10-1 "Soil Treatment Area Long-term Acceptance Rates by Soil Texture, Soil Structure, Percolation Rate and Treatment" in the El Paso County Regulations of the El Paso County Board of Health "On-Site Wastewater Treatment Systems (OWTS) Regulations". The sandy silt encountered in Test Holes A-2 and the lower soils in Test Holes A-1 is Soil Type 2 sandy loam with blocky (bk) soil structure and moderate (2) soil grade. The upper sandy silt in Test Hole A-1 is Soil Type 3 clay loam with blocky (bk) soil structure and moderate (2) soil grade. The lean clay and sandy silty lean clay soil encountered in Test Hole A-3 is Soil Type 4 sandy clay with blocky (bk) soil structure and moderate (2) soil grade. The lean clay withy sand and sandy clay soil encountered in Test Hole A-4 is Soil Type 3 sandy clay loam with blocky (bk) soil structure and moderate (2) soil grade. Listed below are the tactile test results and the anticipated Long-Term Acceptance Rates (LTAR) for the soils tested.

Test Hole	Depth	Soil Type	LTAR (gpd/sf)
A-1	3'-4'	Type 3 clay loam	0.35
	8'-9'	Type 2 sandy loam	0.50
A-2	3'-4'	Type 2 sandy loam	0.50
	8'-9'	Type 2 sandy loam	0.50
A-3	3'-4'	Type 4 sandy clay	0.20
	8'-9'	Type 4 sandy clay	0.20
A-4	3'-4'	Type 3 sandy clay loam	0.35
	8'-9'	Type 2 sandy loam	0.50

The soil types vary across the site, so test pit evaluations are to be performed per the El Paso County OWTS Regulations to determine the Long-Term Acceptance Rates (LTAR) for the soils. The Soil Type 4 sandy clay soils will require that the OWTS in this area will need to be engineered. The other soils encountered will not require that the OWTS be engineered, only sized. The OWTS is to be sized or designed per the site-specific test pit evaluation, resulting LTAR, and estimated effluent flow for each site.

SITE GEOLOGY

This investigation was carried out by means of site inspection by the author of this report, evaluation of test hole data from the soils investigation portion of this report, Geologic Map of Colorado by the U. S. G. S.; "Rocky Mountain Region Oil and Gas Production Map by Terra Graphics; and information obtained from "Soil Survey of El Paso County Area, Colorado" by U. S. D. A. Soil Conservation Service; "Colorado Geology" by Rocky Mountain Association of Geologists, 1980; *"Geologic Map of Colorado" by Ogden Tweto, 1979; and "Eastonville Quadrangle Geologic Map, El Paso County, Colorado" by Matthew L. Morgan and Peter E. Barkmann, 2012.*

1) Topography

The Eastonville Quad Map was reviewed and indicates northwesterly, northerly, and northeasterly slopes. The contour lines and slopes on the site are shown on the Location Map in the report.

2) Soil Data

The "Soil Survey of El Paso County Area, Colorado" from the NRCS was reviewed. *Five (5) soil types are on the property (see attached Natural Resources Conservation Service Web Soil Survey – National Cooperative Soil Survey). Brussett loam, 1 to 3 % slopes (14) is on the approximate east third of the property. Brussett loam, 3 to 5 % slopes (15) extends north to south across the approximate center of the property. Peyton sandy loam, 5 to 9 % slopes (67) is at the southeast property corner. Peyton-Pring complex, 3 to 8 % slopes (68) is on the east property line near the northeast corner of the property. Peyton-Pring complex, 8 to 15 % slopes (69) is along the west property line and on the north property line near the northeast property corner.*

The Brussett loam, 1 to 3 % slopes (14) has moderate permeability, effective rooting depth is 60" or more, high available water capacity, slow surface runoff, and moderate hazard of erosion. This soil is suited to wildlife habitat. The main limitation for urban development are moderate shrink-swell potential and frost action potential. Dwellings and roads can be designed to overcome these limitations. Permeability adversely affects the performance of septic tank absorption fields. Capability subclass IIIc.

The Brussett loam, 3 to 5 % slopes (15) has moderate permeability, effective rooting depth is 60" or more, high available water capacity, rapid surface runoff, and moderate hazard of erosion, especially when snow melts in spring while the ground is frozen. Some gullies are present. This soil is suited to wildlife habitat. The main limitation for urban development are moderate shrink-swell potential and frost action potential. Dwellings and roads can be designed to overcome these limitations. Permeability adversely affects the performance of septic tank absorption fields. Capability subclass IVe.

The Peyton sandy loam, 5 to 9 % slopes (67) has moderate permeability, effective rooting depth is 60" or more, high available water capacity, rapid surface runoff, and moderate hazard of erosion, especially when snow melts in spring while the ground is frozen. Some gullies are present. This soil is suited to wildlife habitat. The main limitation for urban development are moderate shrink-swell potential and frost action potential. Dwellings and roads can be designed to overcome these limitations. Permeability adversely affects the performance of septic tank absorption fields. Capability subclass IVe.

The Peyton-Pring complex, 3 to 8 % slopes (68) has rapid permeability, effective rooting depth is 60" or more, moderate available water capacity, medium surface runoff, and moderate hazard of erosion. This soil is suited to habitat for openland and rangeland wildlife. These soils have a good potential for homesites. The main limitation are low bearing strength and frost action potential. Buildings and roads can be designed to overcome these limitations. Access roads should have adequate cut-slope grade and be provided with drains to control surface runoff and keep soil losses to a minimum. Capability subclass VIe.

The Peyton-Pring complex, 8 to 15 % slopes (69) has moderate to rapid permeability, effective rooting depth is 60" or more, moderate to high available water capacity, medium to rapid surface runoff, and moderate to high hazard of erosion. Some gullies have developed along drainageways and livestock trails. The soils in this complex are used as rangeland, for wildlife habitat, and for homesites. The main limitations are steepness of slope, limited ability to support a load, and frost action potential. Buildings and roads can be designed to overcome these limitations. These soils also require special site or building designs because of the slope. Access roads should have adequate cut-slope grade and be provided with drains to control surface runoff and keep soil losses to a minimum. Capability subclass VIe.

3) Floodplain Maps

West Bijou Creek is approximately 1/2 mile east of the property. The proposed house and OWTS areas are approximately 40' upslope from the flow line. The site is outside the floodplain of the creek.

4) Geology and Basin Maps and Descriptions

The 1979 Ogden Tweto "Geologic Map of Colorado" was reviewed. The map indicates that Twr – White River Formation is at the site. This includes ashy claystone and sandstone. Bedrock was not encountered in the soil borings made at the site.

The 2012 Matthew L. Morgan and Peter E. Barkmann "Eastonville Quadrangle Geologic Map, El Paso County, Colorado" was also reviewed. The map indicates that three (3) soil and rock types are on the property. Gravel of Palmer Divide (QPg) is on the majority of the property. Dawson Formation – Facies unit five (Tkdas) is along the west property line. Alluvium one (Qa1) is in the drainages near the center of the north property line and near the northeast property corner.

5) Aerial Photographs

Satellite maps of the area were reviewed to see if any items of note were apparent. The existing houses around the property, West Bijou Creek east of the property, *and the drainageways on the property* are apparent.

6) Climate Information
   From the USDA 25-YEAR 24 HOUR PRECIPITATION annual isopluvials for Colorado, the site is in an area of approximately *36"* of evaporation per year.
7) Delineated Wetlands Maps
   The up and down slope areas of the property have the same vegetation throughout. Therefore, it appears that the moisture content across the site is consistent, and no wetlands are present.

Regional and Local Setting

The site lies in the Colorado Piedmont Section of the Great Plains Physiographic Province. The Colorado Piedmont is an elongated trough in the great plains, adjacent to the Front Range of the South Rockies. The Colorado Piedmont was formed when uplift of the area in Miocene-Eocene times (20–50 million years ago) produced an increase of stream erosion resulting in scouring next to the foothills and outlying areas. The Piedmont is bordered by the Southern Rockies to the west, Great Plains escarpment to the northeast, and Palmer Divide to the north. More particularly, the site is northeast of the City of Colorado Springs near the north line of El Paso County northeast of Black Forest.

Structurally, the site lies on the western edge of the Denver Basin, a thick accumulation of sediments involved with down warping in the basin area and uplift of the adjacent highland areas in late Cretaceous and early Cenozoic. Small anticlinal folds occur adjacent to the Front Range in the sedimentary rocks and are conducive to the accumulation of oil and gas deposits. The closest know fault to the site is the Rampart Range Fault, which is approximately 18 miles to the west. The fault is believed to be inactive since no recent records of fault movement or earthquakes exist.

Slopes at the site are approximately 1 to 30 % with drainage flowing generally to the northeast. The site does not appear to be located within the 100-year or 500-year flood plain. Groundwater was not encountered in the 12' deep test holes that were drilled, so the groundwater levels are lower than a 12' depth.

Economic Geology

From the test borings made at the site, it does not appear that any mineral resources at the site. Therefore, it does not appear that any mineable areas are on the site. Based on the above data and criteria used, we feel that the site is not large enough and does not contain enough gravel to be economic for mining. Information on oil and gas deposits at the site were not available at this time and there are no oil and gas fields in the area.

Potential Geologic Hazards

Geologic hazards caused by gravity, such as landslides, rock fall, mud and debris flows, and snow avalanches are not anticipated in the present state of the site. Utility trenches may require shoring or bracing in order to create safe working conditions during construction. *Groundwater was not encountered to the 12' test boring depth at the time of drilling on August 1, 2019. In times of high precipitation, it is anticipated that the groundwater elevation would raise and/or a perched water table may develop. Providing a perimeter drain at the base of the basement foundations is recommended to help control water seeping through the basement backfill soils and to provide a means for controlling groundwater fluctuations.*

The Soil Conservation Service (SCS) indicates that there are *five (5) different surficial soils across the site (see the above 2) Soil Data portion under Site Geology). Brussett loam, 1 to 3 % slopes (14) is along the approximate east third of the property. Brussett loam, 3 to 5 % slopes (15) extends north to south across the approximate center of the property. Peyton sandy loam, 5 to 9 % slopes (67) is at the southeast property corner. Peyton-Pring complex, 3 to 8 % slopes (68) is on the east property line near the northeast corner of the property. Peyton-Pring complex, 8 to 15 % slopes (69) is along the west property line and on the north property line near the northeast property corner.* These soils are described by the SCS as having shrink-swell potential, frost action potential, site slope, and low bearing strength.

Because of the slopes at the site, erosion could impact the site where vegetation is removed and/or slopes are increased. A dam has been constructed near the north property line in the drainage through the property. It appears that this dam was constructed to help control erosion of the drainageway. Soil swelling and hydro-consolidation could also occur where water is allowed to saturate the soils. Buildings and roads can be designed to overcome these limitations. Adequate surface drainage is to be provided for both buildings and roads. *Maintaining positive slope away from and using gutters, downspouts, and extensions will help control and direct surface water away from the structures. Using a perimeter drain around the basement level foundations will also collect and remove water that seeps into the building backfill soil. Verifying adequate compaction of the soil at the bottom of footing levels for the building foundations will also help control potential soil hydro-consolidation.* Access roads should have adequate cut-slope grade and be provided with drains to control surface runoff and keep soil losses to a minimum. *Roadway ditches should be designed and constructed with a maximum slope and vegetation to help control ditch erosion. The roads should be constructed with adequate compaction and proper surfacing to provide the needed bearing capacity and minimize potential erosion.*

The soils, which are to support foundations, should be adequate for supporting the road and foundation loads. Each building site should have a complete geotechnical investigation and engineered foundation to minimize the effects of structures on the native sand, silt, and clay soils. *The roadways should be designed for the soils and slopes at the site.*

Groundwater Resources
Potable water is to be supplied by individual water wells on each lot. *If there is shallow groundwater at the site, it should not be used as potable water but may be used for irrigation water pending acceptable water tests and well permits.* Pollution of the groundwater caused by Onsite Wastewater Treatment Systems (OWTS) at the site should not exist due to having the OWTS evaluated and sized/designed per the El Paso County Health Department regulations.

Sewage Disposal
Sewage at the site is to be controlled by using Onsite Wastewater Treatment Systems (OWTS) at the site. The OWTSs used are to be evaluated and sized/designed per the El Paso County Health Department regulations.

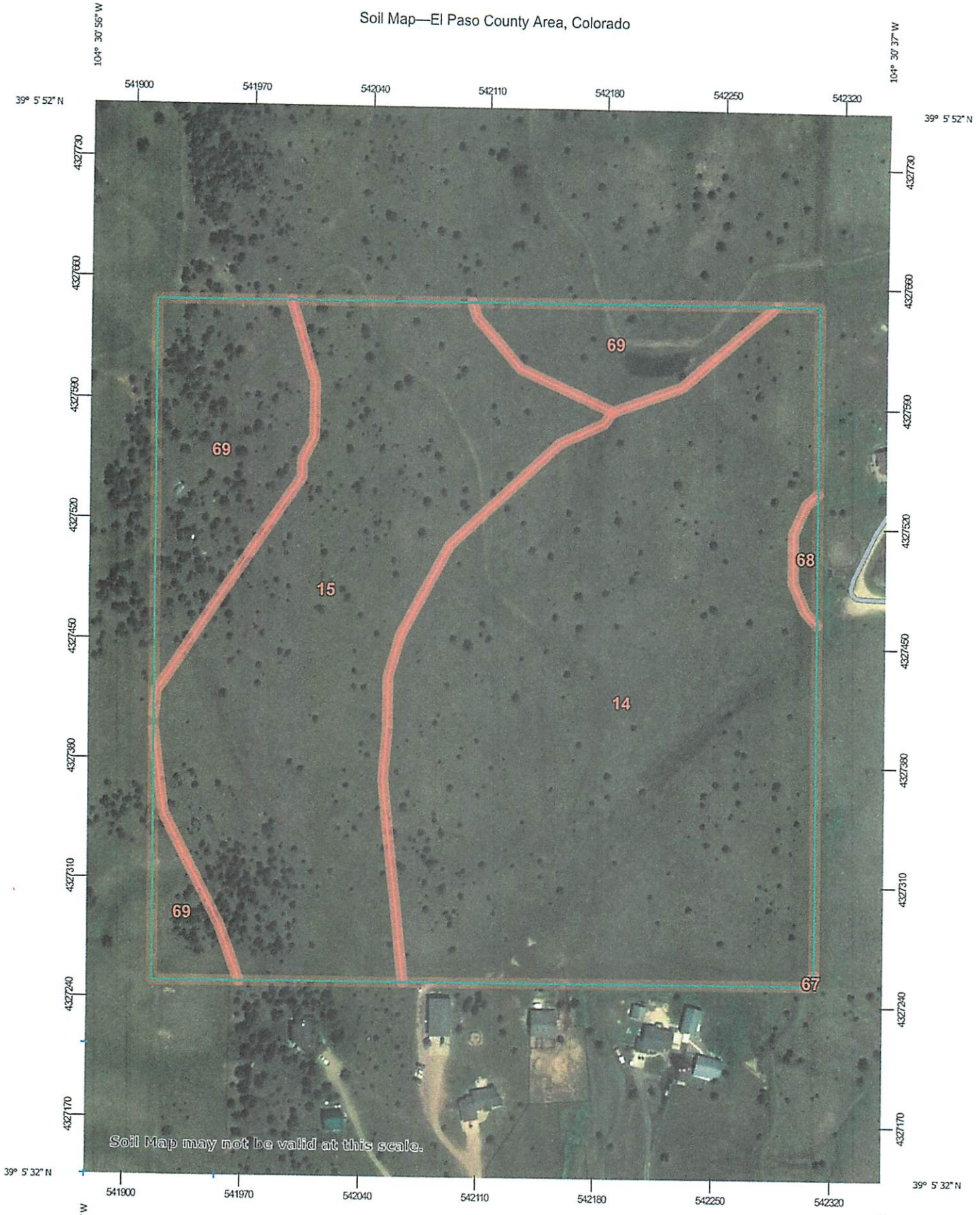
Summary, Conclusions, and Recommendations
The site does not appear to be underlain with sand or gravel, so it is not a mineable site. Oil and gas wells are not located in the area, although sufficient information was not obtainable to determine the economic feasibility for oil and gas production at the site. Shrink-swell potential, frost action potential, site slopes, low bearing strength soils and potential trench caving are hazards which will require attention prior to and during construction process.

Potential hazards can be minimized or eliminated by 1) a geotechnical investigation being performed for each subdivided property and following the recommendations in the report 2) OWTS evaluated and sized/designed per the El Paso County Health Department, and 3) site grading and drainage.

Based on the date mentioned in this report, we feel that the site is suitable for the proposed subdivided lots, provided the recommendations in this report are met. This report does not reflect any variations in surface and subsurface conditions either natural or manmade.

If there are any questions concerning information in this report, please contact our office.

Soil Map—El Paso County Area, Colorado



Map Scale: 1:3,050 if printed on A portrait (8.5" x 11") sheet.

N

0 45 90 180 270 Meters

0 100 200 400 600 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, Jun 5, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 8, 2018—May 26, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
14	Brussett loam, 1 to 3 percent slopes	20.0	51.5%
15	Brussett loam, 3 to 5 percent slopes	12.4	32.1%
67	Peyton sandy loam, 5 to 9 percent slopes	0.0	0.0%
68	Peyton-Pring complex, 3 to 8 percent slopes	0.2	0.5%
69	Peyton-Pring complex, 8 to 15 percent slopes	6.1	15.8%
Totals for Area of Interest		**38.7**	**100.0%**

El Paso County Area, Colorado

14—Brussett loam, 1 to 3 percent slopes

Map Unit Setting

National map unit symbol: 367j
Elevation: 7,200 to 7,500 feet
Frost-free period: 115 to 125 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Brussett and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brussett

Setting

Landform: Flats
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits

Typical profile

A - 0 to 8 inches: loam
BA - 8 to 12 inches: loam
Bt - 12 to 26 inches: clay loam
Bk - 26 to 60 inches: silt loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R048AY222CO
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, Jun 5, 2020

El Paso County Area, Colorado

15—Brussett loam, 3 to 5 percent slopes

Map Unit Setting

National map unit symbol: 367k
Elevation: 7,200 to 7,500 feet
Frost-free period: 115 to 125 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Brussett and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brussett

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits

Typical profile

A - 0 to 8 inches: loam
BA - 8 to 12 inches: loam
Bt - 12 to 26 inches: clay loam
Bk - 26 to 60 inches: silt loam

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R048AY222CO
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, Jun 5, 2020

El Paso County Area, Colorado

67—Peyton sandy loam, 5 to 9 percent slopes

Map Unit Setting

National map unit symbol: 369d
Elevation: 6,800 to 7,600 feet
Mean annual air temperature: 43 to 45 degrees F
Frost-free period: 115 to 125 days
Farmland classification: Not prime farmland

Map Unit Composition

Peyton and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Peyton

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock and/or arkosic residuum weathered from sedimentary rock

Typical profile

A - 0 to 12 inches: sandy loam
Bt - 12 to 25 inches: sandy clay loam
BC - 25 to 35 inches: sandy loam
C - 35 to 60 inches: sandy loam

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R049XB216CO - Sandy Divide
Hydric soil rating: No

Minor Components

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

Other soils

Percent of map unit:
Hydric soil rating: No

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, Jun 5, 2020

El Paso County Area, Colorado

68—Peyton-Pring complex, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 369f
Elevation: 6,800 to 7,600 feet
Farmland classification: Not prime farmland

Map Unit Composition

Peyton and similar soils: 40 percent
Pring and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Peyton

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock and/or arkosic residuum weathered from sedimentary rock

Typical profile

A - 0 to 12 inches: sandy loam
Bt - 12 to 25 inches: sandy clay loam
BC - 25 to 35 inches: sandy loam
C - 35 to 60 inches: sandy loam

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4c
Hydrologic Soil Group: B
Ecological site: R049XB216CO - Sandy Divide
Hydric soil rating: No

Description of Pring

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock

Typical profile

A - 0 to 14 inches: coarse sandy loam
C - 14 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R048AY222CO
Hydric soil rating: No

Minor Components

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

Other soils

Percent of map unit:
Hydric soil rating: No

Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, Jun 5, 2020

El Paso County Area, Colorado

69—Peyton-Pring complex, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 369g
Elevation: 6,800 to 7,600 feet
Farmland classification: Not prime farmland

Map Unit Composition

Peyton and similar soils: 40 percent
Pring and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Peyton

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock and/or arkosic residuum weathered from sedimentary rock

Typical profile

A - 0 to 12 inches: sandy loam
Bt - 12 to 25 inches: sandy clay loam
BC - 25 to 35 inches: sandy clay loam
C - 35 to 60 inches: sandy loam

Properties and qualities

Slope: 8 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R049XB216CO - Sandy Divide
Hydric soil rating: No

Description of Pring

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Arkosic alluvium derived from sedimentary rock

Typical profile

A - 0 to 14 inches: coarse sandy loam
C - 14 to 60 inches: gravelly sandy loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 6.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R049XB222CO - Loamy Park
Hydric soil rating: No

Minor Components

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

Other soils

Percent of map unit:
Hydric soil rating: No

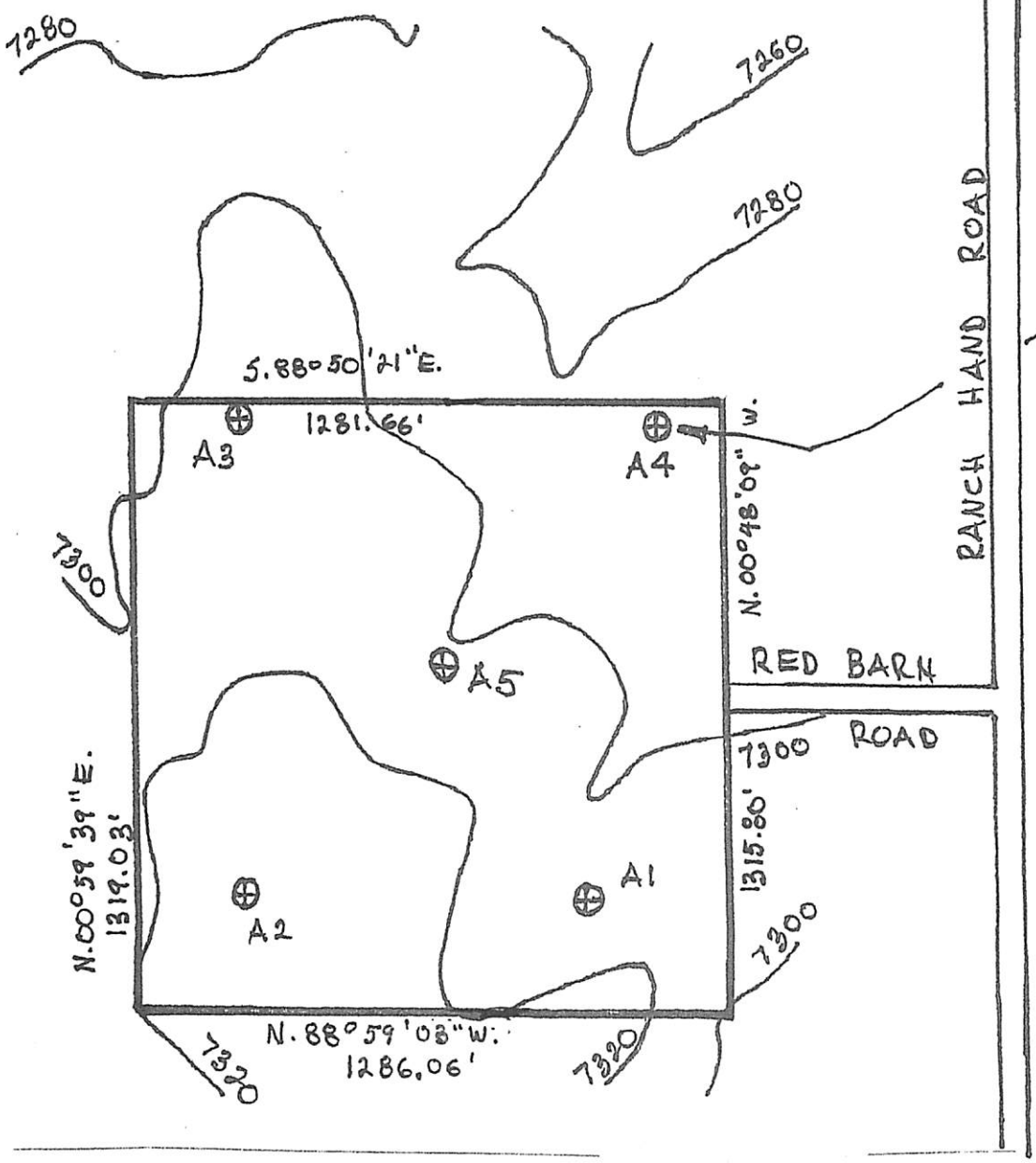
Data Source Information

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, Jun 5, 2020

W.W. ENTERPRISES

LOCATION MAP

SW 1/4 NW 1/4 OF SECTION 13, T. 11 S., R. 64 W., EL PASO COUNTY, COLORADO.



TEST HOLE LOCATION FOR PREVIOUS SUBSURFACE INVESTIGATION AND SOILS REPORT DATED AUGUST 15, 2019

CONTOUR LINES FROM EASTONVILLE QUAD MAP

SCALE: 1" = 400'

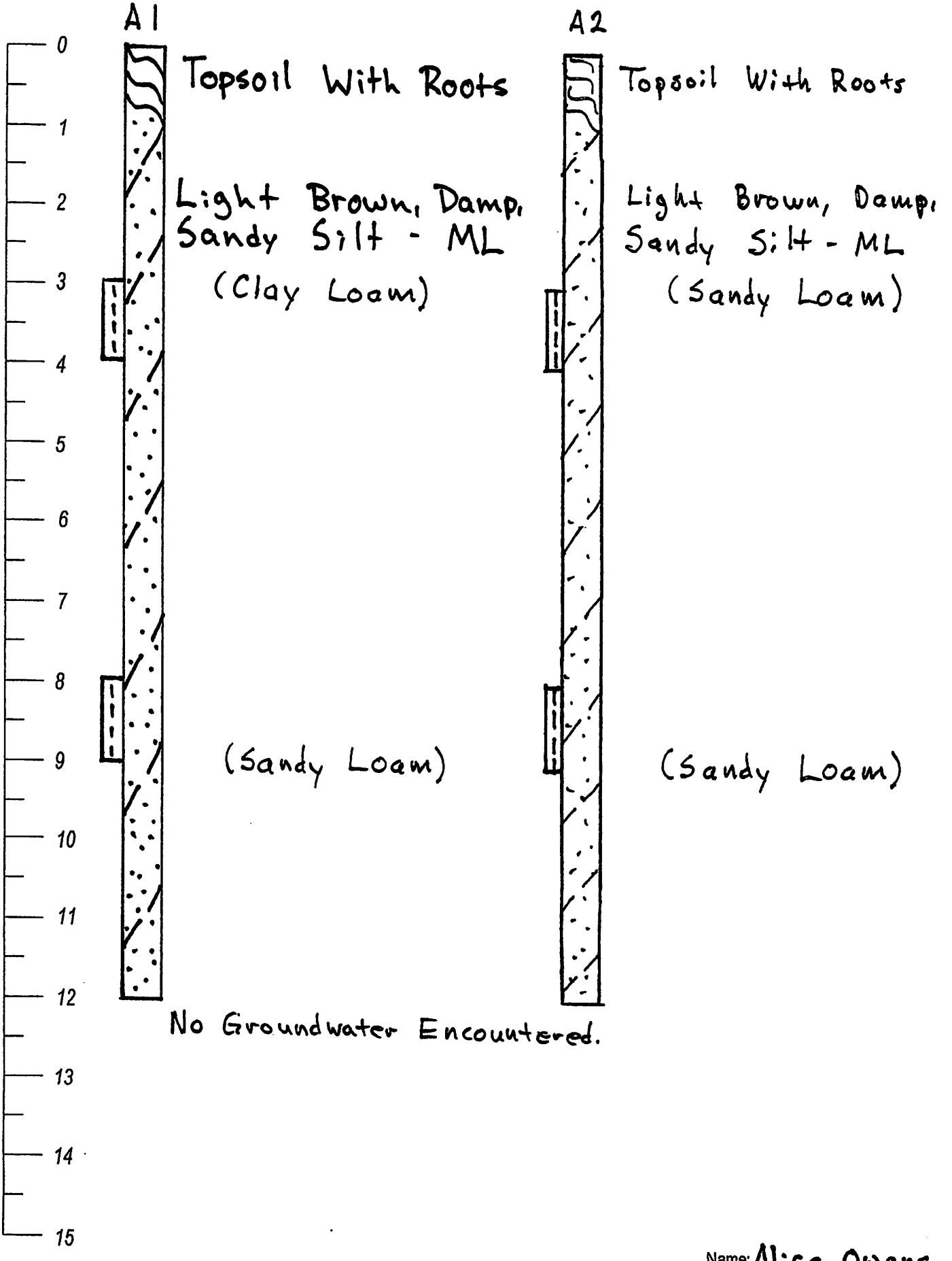
0 100 200 400 800 1200 1600

Name: Owens
Project No.: 19-3028

17055 Red Barn Road, Peyton, El Paso County, Colorado.

W.W. ENTERPRISES

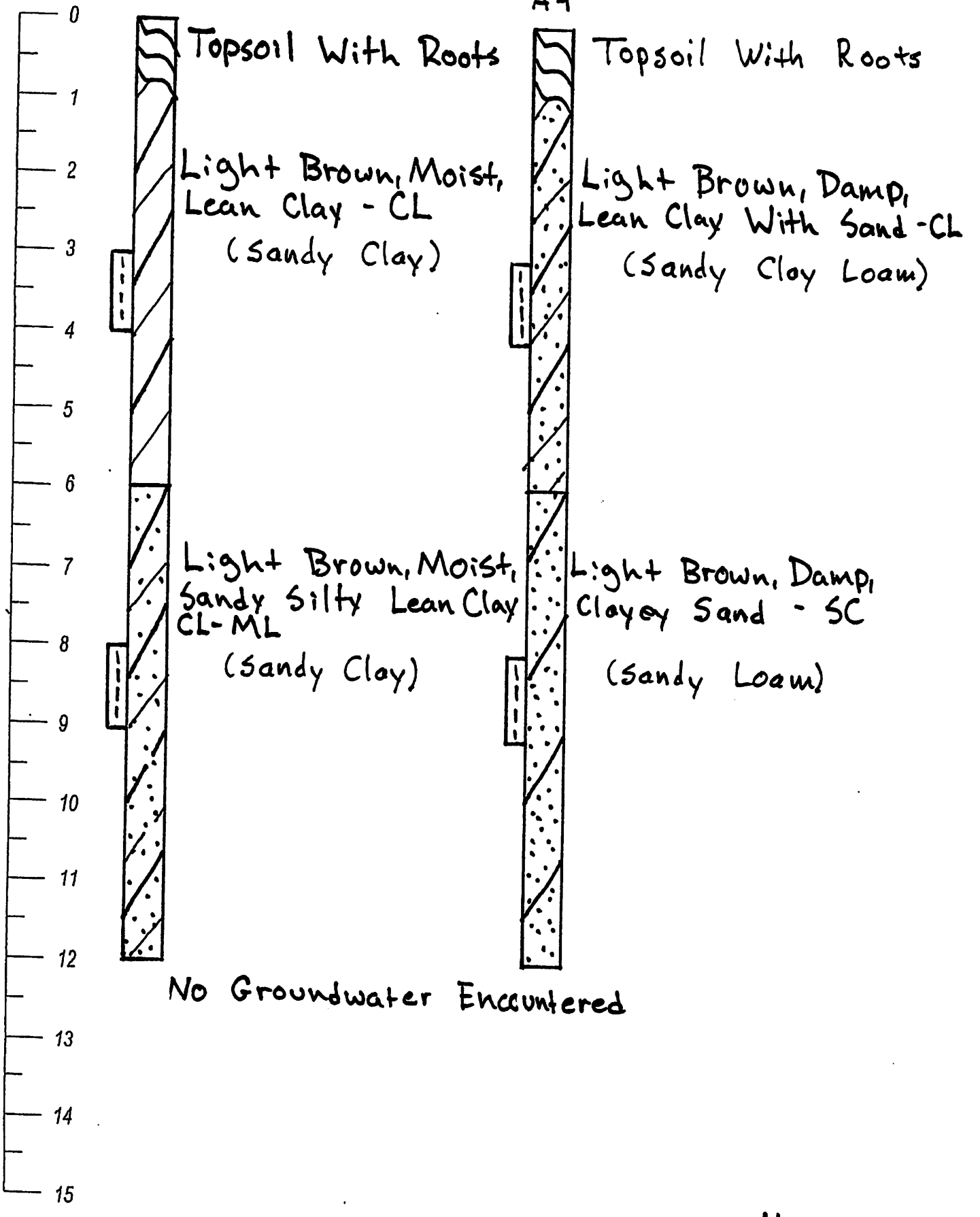
LOG OF TEST HOLES



Name: Alice Owens
Project No.: 19-3028

W.W. ENTERPRISES

LOG OF TEST HOLES

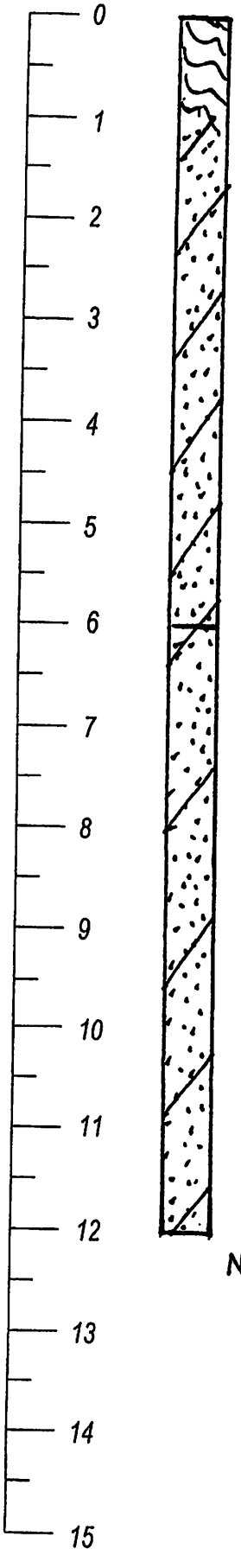


Name: Alice Owens
Project No.: 19-3028

W.W. ENTERPRISES

LOG OF TEST HOLES

A5



Topsoil With Roots

Light Brown, Damp,
Lean Clay With Sand - CL
(Sandy Clay Loam)

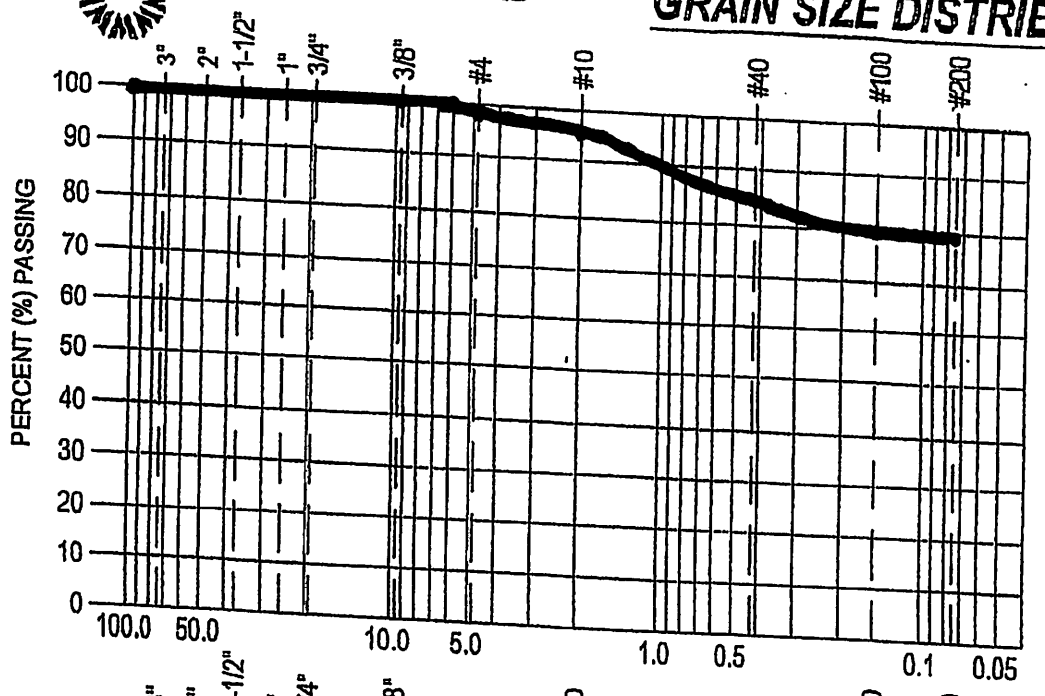
Light Brown, Damp,
Clayey Sand - SC
(Sandy Loam)

No Groundwater Encountered.

Name: Owens
Project No.: 19-3028

W.W. ENTERPRISES

GRAIN SIZE DISTRIBUTION CURVES



A1 @3'-4' LEVEL

A-4 (0) AASHTO

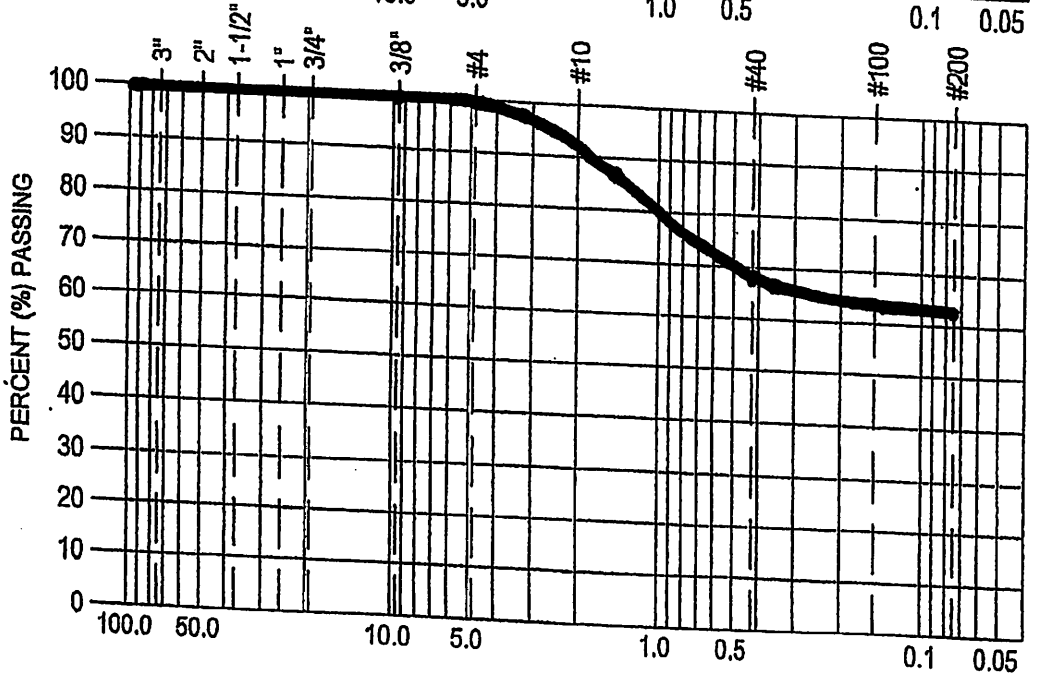
ML ASTM

SIEVE	% PASSING
3/4"	100
3/8"	100
#4	98
#10	95
#40	84
#100	80
#200	79

LL-31, PL-27, PI-4

Low SWELLING

NATURAL MOISTURE CONTENT = 10.2 %



A1 @8'-9' LEVEL

A-4 (0) AASHTO

ML ASTM

SIEVE	% PASSING
3/4"	100
3/8"	100
#4	99
#10	92
#40	67
#100	63
#200	62

LL-31, PL-27, PI-4

Low SWELLING

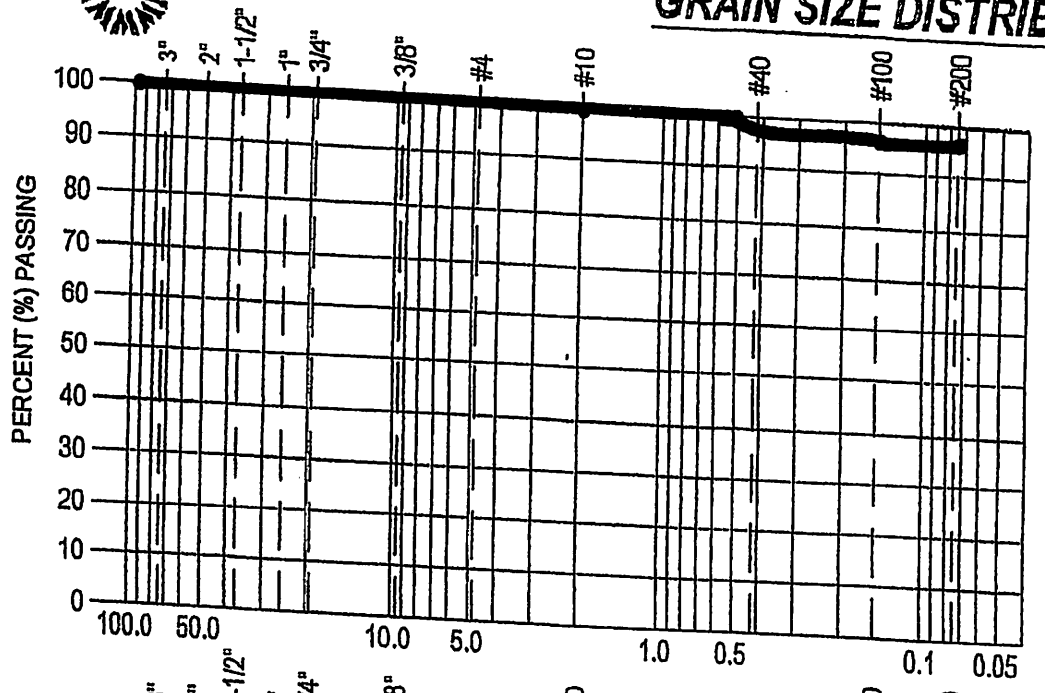
NATURAL MOISTURE CONTENT = 8.9 %

Name: Alice Owens

Project No.: 19-3028

W.W. ENTERPRISES

GRAIN SIZE DISTRIBUTION CURVES



A3 @3'-4' LEVEL

A-4 (0) AASHTO

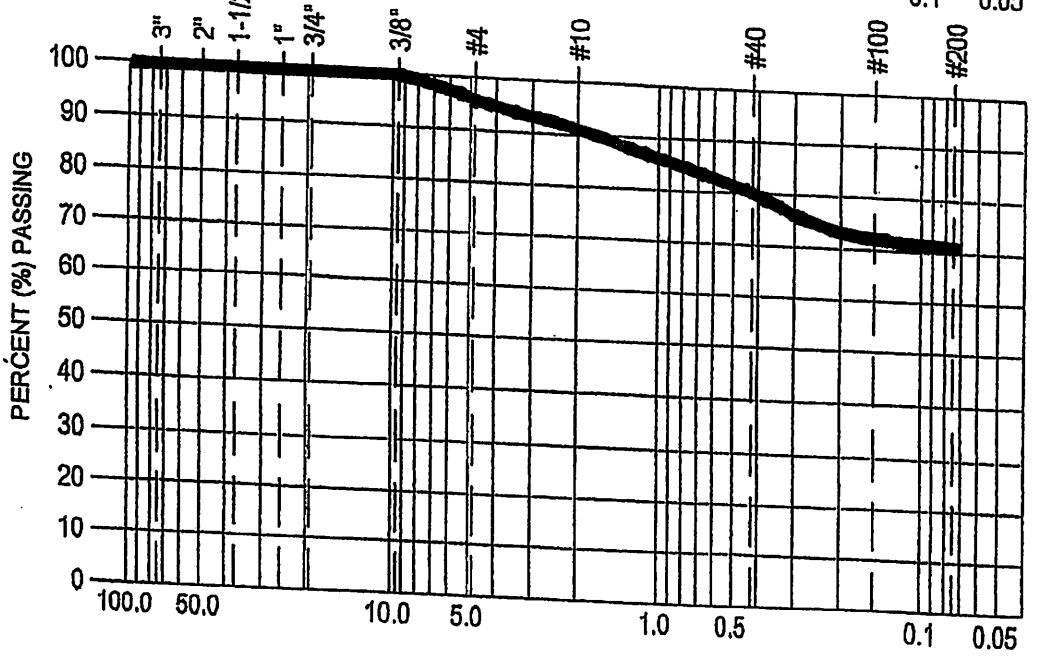
CL ASTM

SIEVE	% PASSING
3/4"	100
3/8"	100
#4	100
#10	100
#40	97
#100	96
#200	96

LL-30, PL-21, PI-9

Low SWELLING

NATURAL MOISTURE CONTENT = 20.4 %



A3 @8'-9' LEVEL

A-4 (0) AASHTO

CL-ML ASTM

SIEVE	% PASSING
3/4"	100
3/8"	100
#4	95
#10	91
#40	80
#100	72
#200	71

LL-25, PL-20, PI-5

Low SWELLING

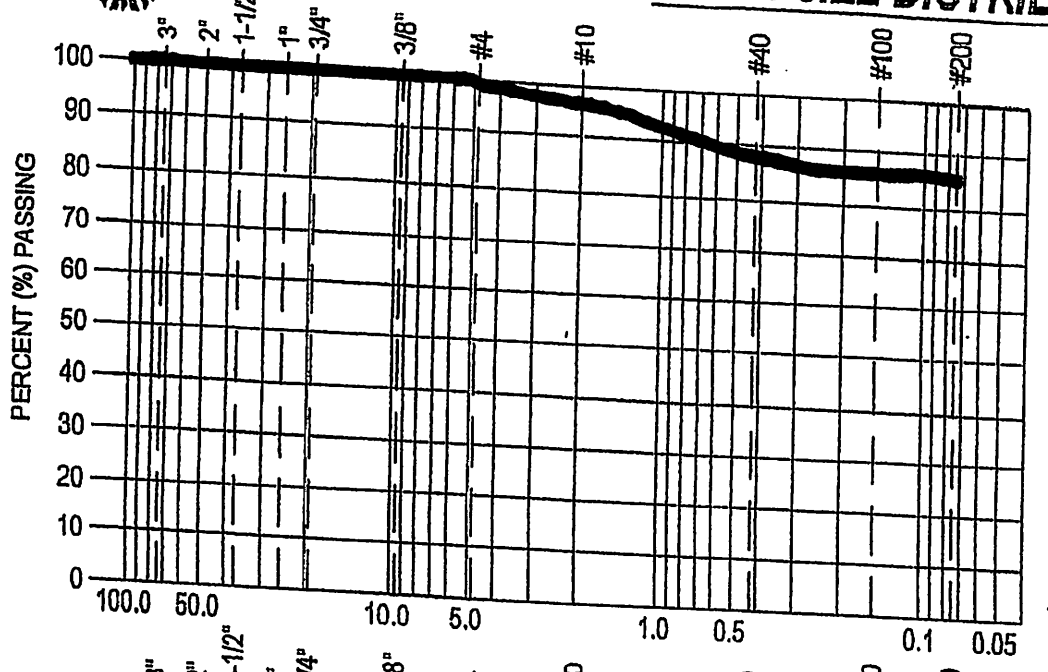
NATURAL MOISTURE CONTENT = 20.7 %

Name: Alice Owens

Project No.: 19-3028

W.W. ENTERPRISES

GRAIN SIZE DISTRIBUTION CURVES



A4 @ 3'-4' LEVEL

A-6 (1) AASHTO

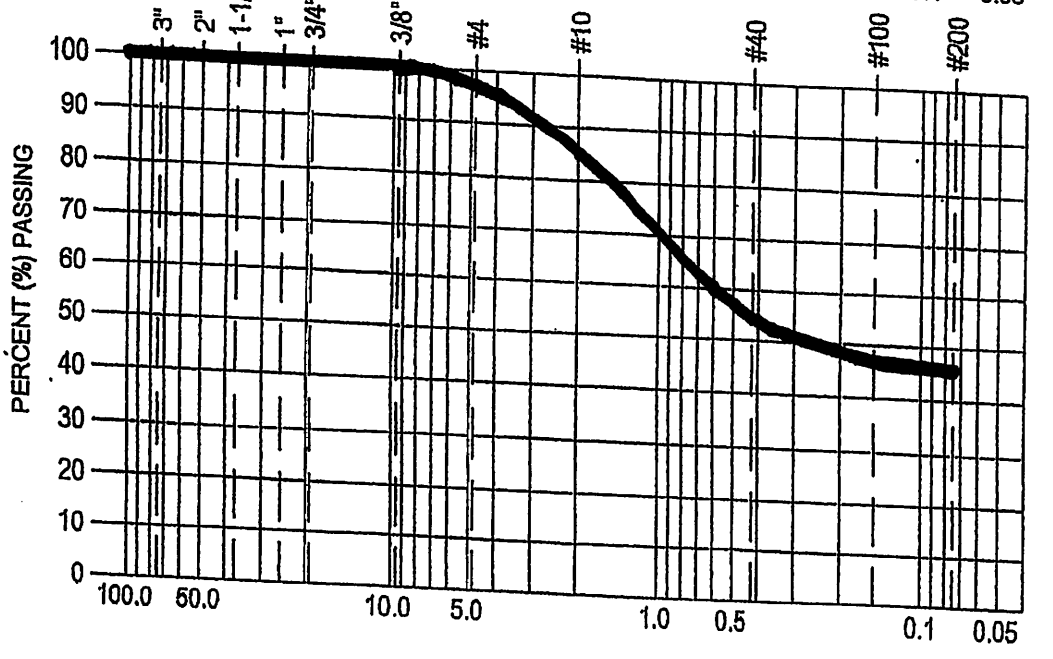
CL ASTM

SIEVE	% PASSING
3/4"	100
3/8"	100
#4	99
#10	96
#40	88
#100	86
#200	85

LL - 32, PL - 21, PI - 11

Low SWELLING

NATURAL MOISTURE CONTENT = 7.7 %



A4 @ 8'-9' LEVEL

A-6 (2) AASHTO

SC ASTM

SIEVE	% PASSING
3/4"	100
3/8"	100
#4	97
#10	84
#40	53
#100	47
#200	46

LL - 32, PL - 15, PI - 17

Low SWELLING

NATURAL MOISTURE CONTENT = 5.9 %

Name: Alice Owens

Project No.: 19-3028

APPENDIX I

POST CONSTRUCTION SITE PREPARATION AND MAINTENANCE

Backfill:

When encountering potentially expansive or consolidating soils, measures should be taken to prevent the soil from being wetted during and after construction. Generally, this can be accomplished by ensuring that the backfill placed around the foundation walls will not settle after completion of construction, and that this backfill material is relatively impervious. Water may need to be added to backfill material to allow proper compaction - do not puddle or saturate. Backfill should be mechanically compacted to at least 95% of Standard Proctor around all structures and 90% of Standard Proctor elsewhere. Compaction requirements should be verified with field tests by the Engineer.

Surface Drainage:

The final grade should have a positive slope away from the foundation walls on all sides. A minimum of twelve inches (12") in the first ten feet (10') is recommended. Downspouts and sill cocks should discharge into splash blocks that extend beyond the limits of the backfill. Splash blocks should slope away from the foundation walls. The use of long downspouts in lieu of splash blocks is advisable. Surface drainage away from the foundation should be maintained throughout the lifetime of the structure.

Lawn Irrigation:

Do not install sprinkler systems next to foundation walls, porches, or patio slabs. If sprinkler systems are installed, the sprinkler heads should be placed so that the spray from the heads under full pressure does not fall within 5' of foundation walls, porches, or patio slabs. Lawn irrigation must be carefully controlled.

If the future owners desire to plant next to foundation walls, porches, or patio slabs, and are willing to assume the risk of structural damage, etc., then it is advisable to plant only flowers and shrubbery (no lawn) of varieties that require very little moisture. These flowers and shrubs should be hand watered only. Landscaping with a plastic covering around the foundation area is not recommended.

Check with your local landscaper for fabrics which allow evaporation when inhibiting plant growth when a plastic landscape covering is desired.

Experience shows that the majority of problems with foundations due to water conditions are generally due to the owner's negligence of maintaining proper drainage of water from the foundation area. The future owners should be directed to pertinent information in this report.

Eff. 01-14-05, revised 03-29-07